



PATENT SPECIFICATION

NO DRAWINGS

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COMPLETE SPECIFICATION

Improvements in or relating to Malt Beverages

We, BAXTER LABORATORIES INC., of Merton Grove, Illinois, United States of America, a Corporation organized and existing under the Laws of the State of Delaware, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a process for the stabilization of the foamy head of fermented malt beverages such as beer, ale or the like so as to improve the amount and persistence of the foamy head on the beverage before consumption. The term "beer" as used throughout this specification refers also to ale or any other type of malt beverage.

The foamy head on a cool glass of beer is a time honored characteristic that distinguishes beer from all other drinks. It not only provides a gracious sight for the eyes when seeing the fine mesh of white bubbles floating atop the sparkling amber fluid but also is strictly utilitarian device that improves the flavor and palatability of the beverage. In the formation of the foam when the beverage is poured, aromatic constituents and hop flavoring materials are adsorbed on the fine bubble interfaces and are carried up and concentrated in the foam where they are more readily inhaled to stimulate the olfactory nerve endings. A beer with a foam on it is a much more flavorful and palatable drink than one where the foam has dissipated. The persistence of the foam is thus of importance to the consumer to prolong the taste enjoyment of the beverage.

The production and formation of a foam on pouring is the result of a very complicated system of physicochemical reactions. The interplay of factors in this complex system

A beer prepared from a good malt and processed under ideal conditions should produce a good foam. However, there are many factors in the malting, brewing and processing which may deleteriously affect the foam. Some of these factors are beyond the brewer's control, such as natural variations in the lots of barley from which the malt is prepared, variations in the condition of malting process and the use of new varieties of barley by the maltsters in their constant striving to improve the quality of their malt. There are many factors that make up a high quality malt and foam potentiality is only one. It is possible to have a high quality malt in respect to its many-fold characteristics and yet it may only be mediocre as regards to foam potentiality. During the brewing, fermentation and the lagering of the beer, there are many points where the foaminess of the final beverage may be adversely affected.

Suffice it to say that a great many brewmasters are more than pleased with the many characteristics of their beers, such as flavor, palatability, clarity, chillproofness, shelf-like stability and yet feel that the foam can be improved on the beers prepared from present day malt.

In accordance with the present invention, it has been found that the potential foaminess of beers can be greatly improved by the introduction into the beverage of zinc ions. The present invention provides a process of preparing a fermented malt beverage with improved foaming characteristics, which includes the step of adding zinc ions to the beverage. The introduction of the zinc ions has no effect on any other characteristics of the beer such as taste, clarity or appearance, but produces unusual increases in foaminess, foam stability and foam persistence. It has been found that the addition of zinc ions

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still further improves the foam characteristics of such beer.

It has still further been found that the addition of chelating agents does not affect the foam properties of zinc treated beer.

One characteristic of the beer foam that is greatly desired is the ability of the foam to deposit a lacy network pattern on the sides of the glass as the beer is consumed. The addition of the traces of zinc appears to make the drying beer foam more attractive to the glass surfaces so that a more extensive pattern and a denser litness on the glass is obtained. The foam from the zinc treated beers appears to "wet" the glass better and adhere more firmly to the viscous surface.

The addition of certain metals like iron, cobalt, nickel, tin, uranium and titanium to beer even in minute trace quantities, disturbs the existing delicate physico-chemical equilibrium and makes the beer become "wild". Wildness is a phenomenon where the beer gushes out of the bottle or can when it is opened and sprays the beer all over. Surprisingly the addition of the zinc ions, even in amounts beyond the minimum necessary to improve foam, does not induce this effect. Zinc ions are apparently unable to form the "wild beer nuclei" that are are thought to be responsible for this phenomenon.

Zinc is a nutritionally important metal being one of the essential metals required by the body for optimum nutrition. Like other essential trace metals, a certain level should be ingested daily for maintaining good health and nutrition. The use of traces of zinc in beer to improve the foaminess thereby makes the beer a more complete foodstuff and prevents abnormal states which may result from a zinc deficient diet.

The trace of zinc ions that we have found very suitable for beer are in the range of about 5 to 25 parts per million. The upper range may, if desired, be extended beyond the optimum range to amounts of 100 or even to 500 parts per million. There is not much point in employing these extremely high levels as the foam improvement is not directly proportional to the zinc ion concentration at these high levels of treatment.

At the present time there are available certain gummy types of materials such as gum arabic, propylene glycol aginate, carboxy methyl cellulose or carboxy methyl hydroxyethyl cellulose which are used by brewers, with more or less success, to improve the foam of the beer. The materials are generally added to the fermented beer in storage at levels of about 2 to 5 pounds per 100 barrels. This is equivalent to approximately 80 to 200 parts per million. It has been found that zinc ions and the gummy type of foam stabilizers are complimentary in their foam stabilizing effect and the combined

use of these materials permits the realization of foam improvements hitherto impossible of achievement.

The zinc or the mixture of zinc and gummy material may be added at any point in the brewing process. It is preferred to add the treatment to the fermented beer at the beginning of the cold storage period. It may be added to the beer before or after prefiltration early in storage or it can also be added late in storage before or after the final filtration, immediately before packaging.

EXAMPLE I

A solution of 650 grams of zinc sulfate ($\text{ZnSO}_4 \cdot \text{H}_2\text{O}$) in 5 gallons of water is prepared. This solution is pumped into the beer line through a proportioning pump as pre-filtered fermented beer is flowing from the filter into a 200 barrel storage tank. The rate of flow of the zinc solution is adjusted so that the addition is distributed over the pumping cycle of the beer and all the solution is added by the time the 200 barrel tank is full. The beer will contain zinc added to the extent of 10 parts per million. This beer is then processed in the usual manner. The beer after being processed in the regular manner without further change, possessed superior foaming properties as compared to beer which had been similarly prepared but did not contain added zinc ions.

EXAMPLE 2

A solution of 650 grams of zinc sulfate ($\text{ZnSO}_4 \cdot \text{H}_2\text{O}$) in 10 gallons of water is prepared. This solution is proportioned into the line through which ale is flowing from the final filtration filter to a 400 barrel bottling tank. The rate of flow is adjusted so that the 10 gallons of zinc solution is completely added when the tank becomes full of ale. The treatment level amounts to 5 ppm. of zinc. The beer after being processed in the regular manner, without further change, possessed superior foaming properties as compared to beer which had been similarly prepared but did not contain added zinc ions.

EXAMPLE 3

608 grams of zinc chloride (ZnCl_2) are dissolved in about 10 gallons of water. This solution is added through the manhole to an empty 100 barrel beer storage tank. The manhole is closed and the beer valve is opened to permit beer to flow into the tank. The currents and counter currents caused by the rapidly inflowing beer are depended upon to thoroughly mix the contents of the tank and make an even dispersion of the zinc solution throughout the beer tank. When the tank is full, the beer valve is closed. This addition amounts to 25 parts per million of zinc. The beer after being processed in the regular manner without further change possessed

superior foaming properties as compared to beer which had been similarly prepared and did not contain added zinc ions.

EXAMPLE 4

5 A dry mixture of 66 parts by weight of Gum Arabic and 14 parts by weight zinc sulfate ($\text{ZnSO}_4 \cdot \text{H}_2\text{O}$) is prepared. A 5% aqueous solution of this mixture is prepared and added to a small tank connected with
10 a proportioning pump. This solution is pumped into beer flowing through beer lines into storage tanks at the rate of 2 pounds of the dry mixture per 100 barrels of beer. This treatment level adds 5 parts per million of zinc to the beer in addition to 66 parts
15 per million of gum arabic. The beer after being processed in the regular manner without further change possessed superior foaming properties as compared to beer which
20 had been similarly prepared but did not contain added zinc ions. It also possessed superior foam properties when compared to beer containing gum arabic but no added zinc ions.

EXAMPLE 5

25 A dry mixture of 26 parts by weight of propylene glycol alginate and 14 parts by weight of zinc sulfate ($\text{ZnSO}_4 \cdot \text{H}_2\text{O}$) is prepared. A 1% solution of this mixture is made and added to beer at the rate of 1
30 pound of dry mixture per 100 barrels. This gives a treatment level of 5 parts per million of zinc and about $\frac{1}{2}$ pound of propylene glycol alginate per 100 barrels. The beer after being
35 processed in the regular manner without further change possessed superior foaming properties as compared to beer which had been similarly prepared but did not contain added zinc ions. It also possessed superior
40 foam properties when compared to beer containing propylene glycol alginate but no added zinc ions.

EXAMPLE 6

45 Beer previously treated with carboxy methyl cellulose at a level of 1 pound per 100 barrels to enhance the foam properties is pumped from one storage tank to another. While in transit from tank to tank, a solution of zinc sulfate ($\text{ZnSO}_4 \cdot \text{H}_2\text{O}$) 325 grams
50 in 10 gallons of water is added to each 100 barrels of beer. This brings the zinc concentration of the beer to 10 parts per million. The beer after being processed in the regular manner without further change possessed
55 superior foaming properties as compared to beer which had been similarly prepared but did not contain added zinc ions. It also possessed superior foam properties when compared to beer containing the carboxy methyl cellulose but no added zinc ions.
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by weight of zinc sulfate ($\text{ZnSO}_4 \cdot \text{H}_2\text{O}$) is prepared. A 1% aqueous solution is prepared and used similar to those described in Examples 4, 5 and 6. When added at the rate of $\frac{1}{2}$ pounds per 100 barrels, the zinc level will be about 7 parts per million and the carboxy methyl hydroxy ethyl cellulose treatment at 1 pound per 100 barrels. The foam properties of the beer thus treated were superior when compared to otherwise identical untreated beers.

Many variations may be made in the above examples; for instance, any soluble zinc salt such as zinc acetate, zinc nitrate or zinc lactate, may be substituted for the zinc sulfate or zinc chloride. Such salts should of course be non-toxic in the amount used. The proportions of the gummy materials to zinc as specified in examples 4, 5, 6 and 7 may be varied over a wide range. For instance, the zinc salt can be as low as 1% of the mixture or up to 70% of the mixture. The amount of these different mixtures may be used from 0.5 to 10 pounds per 100 barrels of beer.

In all the above examples, the resulting beers produced with the added zinc ions produced a much more generous head of foam on pouring, a head which is longer lasting, more persistent and flavorful and leaves a greater pattern of foamy laciness on the walls of the glass than do similar beers prepared without the added zinc ions.

It has been found that the addition of the chelating agents such as glycine, the salts of ethylene diamine tetra-acetic acid (EDTA), N-hydroxy ethyl ethylene diamine triacetic acid, sodium glutamate, cyclohexane, 1,2-diamino tetraacetic acid, diethylene triamine pentaacetic acid and hydroxy acids such as lactic, tartaric, citric, malic or gluconic acid in part per million quantities prevents those rare individuals with super-sensitive tastes from discerning or detecting the taste of the zinc ions. Generally these chelating agents are added in amounts of about 50% of the weight of the zinc ions.

Reference is made to the Specification of co-pending Application No. 1138/63 (Serial No. 950129) entitled "Improvements in and relating to malt beverages in which is described a composition of matter for improving the foam of fermented malt beverages."

WHAT WE CLAIM IS:—

1. A process of preparing a fermented malt beverage with improved foaming characteristics, which includes the step of adding zinc ions to the beverage.

2. A process according to Claim 1 in which the zinc ions are added to the beverage in amounts of 5 to 800 parts per million.

3. A process according to Claim 1 in which the zinc ions are added to the beverage in amounts of 5 to 800 parts per million.

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which the gummy material is one of the following namely gum arabic, propylene glycol alginate, carboxy methyl cellulose or carboxy methyl hydroxy ethyl cellulose.

- 5 5. A process of preparing a fermented malt beverage substantially as described herein with reference to the examples.

6. A fermented malt beverage when prepared according to any one of the preceding Claims.

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By ERIC POTTER & CLARKSON,
Chartered Patent Agents.